

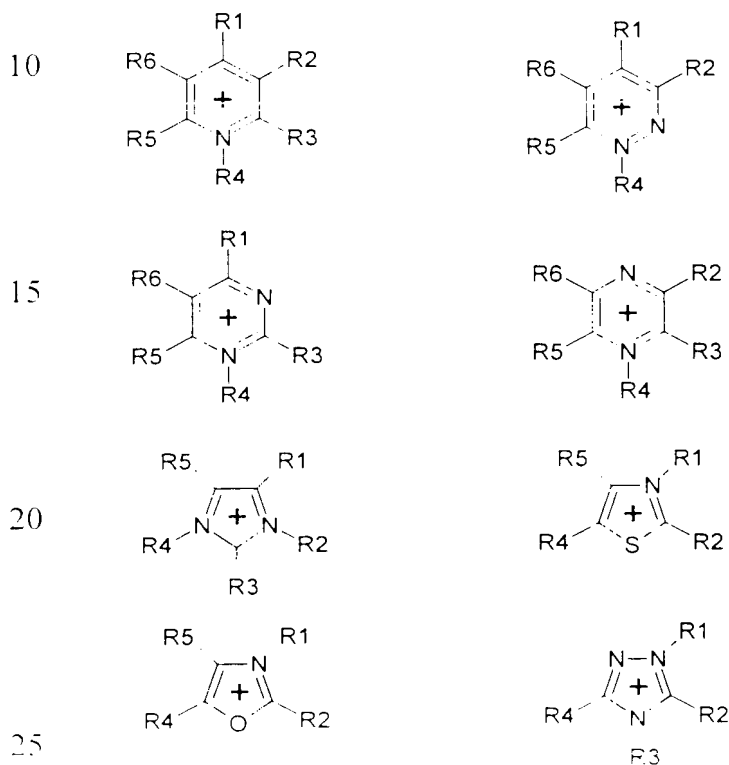
# Claims

1. An ionic liquid of the general formula



wherein:

$K^+$  is a cation selected from:



wherein

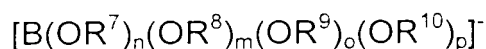
$R^1$  to  $R^6$  are identical or different and are each individually

- H,

partially or fully substituted by F, Cl,  $N(C_1F_{2-4}, H_x)_2$ ,  $O(C_1F_{2-4}, H_x)$ ,  $SO_2(C_1F_{2-4}, H_x)$  or  $C_1F_{2-4}H_x$ , wherein  $1 < n < 6$  and  $0 < x < 13$

- a phenyl radical which is unsubstituted or which is partially or fully substituted by F, Cl,  $N(C_nF_{(2n+1-x)}H_x)_2$ ,  $O(C_nF_{(2n+1-x)}H_x)$ ,  $SO_2(C_nF_{(2n+1-x)}H_x)$  or  $C_nF_{(2n+1-x)}H_x$  wherein  $1 < n < 6$  and  $0 < x \leq 13$
- 5     - one or more pairs of adjacent  $R^1$  to  $R^6$  can also be an alkylene or alkenylene radical and having up to 8 C atoms, wherein the radical is unsubstituted or partially or fully substituted by halogen,  $N(C_nF_{(2n+1-x)}H_x)_2$ ,  $O(C_nF_{(2n+1-x)}H_x)$ ,  $SO_2(C_nF_{(2n+1-x)}H_x)$  or  $C_nF_{(2n+1-x)}H_x$  wherein  $1 < n < 6$  and  $0 < x \leq 13$

10     wherein  $A^-$  is an anion selected from



wherein

15      $0 \leq n, m, o, p \leq 4$ , and  $m+n+o+p=4$ , and

$R^7$  to  $R^{10}$  are different or identical and are each, individually:

20     an aromatic ring selected from a phenyl, naphthyl, anthracenyl and phenanthrenyl ring, which is unsubstituted, or which is monosubstituted or polysubstituted by  $C_nF_{(2n+1-x)}H_x$ , wherein  $1 < n < 6$  and  $0 < x \leq 13$ , or halogen,

25     an aromatic heterocyclic ring selected from a pyridyl, pyrazyl and pyrimidyl ring, which is unsubstituted, or which is monosubstituted or polysubstituted by  $C_nF_{(2n+1-x)}H_x$ , wherein  $1 < n < 6$  and  $0 < x \leq 13$ , or halogen, or

30     an alkyl radical ( $C_1$  to  $C_8$ ), which is unsubstituted, or which is partially or fully substituted by F, Cl,  $N(C_nF_{(2n+1-x)}H_x)_2$ ,  $O(C_nF_{(2n+1-x)}H_x)$ ,  $SO_2(C_nF_{(2n+1-x)}H_x)$ , or  $C_nF_{(2n+1-x)}H_x$  wherein  $1 < n < 6$  and  $0 < x \leq 13$

and wherein one or more pairs of  $R^7$  to  $R^{10}$  can also form

35     anthracenyliene and phenanthrenyliene ring, which is unsubstituted or which is monosubstituted or polysubstituted by  $C_nF_{(2n+1-x)}H_x$ , wherein  $1 < n < 6$  and  $0 < x \leq 13$ , or halogen

an aromatic heterocyclic ring selected from a pyridylene, pyrazylene and pyrimidylene ring, which is unsubstituted, or which is mono-substituted or polysubstituted by  $C_nF_{(2n+1-x)}H_x$ , wherein  $1 < n < 6$  and  $0 < x \leq 13$ , or halogen, or

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an alkylene or alkenylene radical having up to 8 C atoms and which is unsubstituted or which is partially or fully substituted by halogen,  $N(C_nF_{(2n+1-x)}H_x)_2$ ,  $O(C_nF_{(2n+1-x)}H_x)$ ,  $SO_2(C_nF_{(2n+1-x)}H_x)$  or  $C_nF_{(2n+1-x)}H_x$  wherein  $1 < n < 6$  and  $0 < x \leq 13$

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or  $OR^7$  to  $OR^{10}$ ,

individually or together, are an aromatic having 6 to 14 C atoms or are aliphatic having 1 to 6 C atoms and which is a carboxyl, dicarboxyl, oxysulfonyl or oxycarbonyl radical, which is unsubstituted, or which is partially or fully substituted by F, Cl,  $N(C_nF_{(2n+1-x)}H_x)_2$ ,  $O(C_nF_{(2n+1-x)}H_x)$ ,  $SO_2(C_nF_{(2n+1-x)}H_x)$  or  $C_nF_{(2n+1-x)}H_x$ , wherein  $1 < n < 6$  and  $0 < x \leq 13$ .

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2. An ionic liquid according to claim 1, wherein at least one of  $R^1$  to  $R^6$  of the cation is an alkyl radical which is unsubstituted or partially or fully substituted by F, Cl,  $N(C_nF_{(2n+1-x)}H_x)_2$ ,  $O(C_nF_{(2n+1-x)}H_x)$ ,  $SO_2(C_nF_{(2n+1-x)}H_x)$  or  $C_nF_{(2n+1-x)}H_x$  wherein  $1 < n < 6$  and  $0 < x \leq 13$

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3. An ionic liquid according to claim 1, wherein at least one of  $R^1$  to  $R^6$  of the cation is a phenyl radical which is unsubstituted or partially or fully substituted by F, Cl,  $N(C_nF_{(2n+1-x)}H_x)_2$ ,  $O(C_nF_{(2n+1-x)}H_x)$ ,  $SO_2(C_nF_{(2n+1-x)}H_x)$  or  $C_nF_{(2n+1-x)}H_x$  wherein  $1 < n < 6$  and  $0 < x \leq 13$ .

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4. An ionic liquid according to claim 1, wherein at least a pair of  $R^1$  to  $R^6$  of the cation is an alkylene or alkenylene radical which is unsubstituted or partially or fully substituted by halogen,  $N(C_nF_{(2n+1-x)}H_x)_2$ ,  $O(C_nF_{(2n+1-x)}H_x)$ ,  $SO_2(C_nF_{(2n+1-x)}H_x)$  or  $C_nF_{(2n+1-x)}H_x$  wherein  $1 < n < 6$  and  $0 < x \leq 13$

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5. An ionic liquid according to claim 1, wherein at least one of  $R^1$  to  $R^6$  of the anion is an alkyl radical which is unsubstituted or partially

or fully substituted by F, Cl,  $N(C_nF_{(2n+1-x)}H_x)_2$ ,  $O(C_nF_{(2n+1-x)}H_x)$ ,  $SO_2(C_nF_{(2n+1-x)}H_x)$ , or  $C_nF_{(2n+1-x)}H_x$ , wherein  $1 < n < 6$  and  $0 < x \leq 13$ .

5 6. An ionic liquid according to claim 1, wherein at least one pair of  $R^7$  to  $R^{10}$  of the anion is an alkylene or alkenylene radical which is unsubstituted or partially or fully substituted by a halogen,  $N(C_nF_{(2n+1-x)}H_x)_2$ ,  $O(C_nF_{(2n+1-x)}H_x)$ ,  $SO_2(C_nF_{(2n+1-x)}H_x)$  or  $C_nF_{(2n+1-x)}H_x$  wherein  $1 < n < 6$  and  $0 < x \leq 13$ .

10 7. An ionic liquid according to claim 1, wherein at least one of  $R^7$  to  $R^{10}$  of the anion is an aromatic ring selected from a phenyl, naphthyl, anthracenyl and phenanthrenyl ring, which is unsubstituted, or which is monosubstituted or polysubstituted by  $C_nF_{(2n+1-x)}H_x$ , wherein  $1 < n < 6$  and  $0 < x \leq 13$ , or by a halogen.

15 8. An ionic liquid according to claim 1, wherein at least one of  $R^7$  to  $R^{10}$  of the anion is an aromatic heterocyclic ring selected from a pyridyl, pyrazyl and pyrimidyl ring, which is unsubstituted, or which is monosubstituted or polysubstituted by  $C_nF_{(2n+1-x)}H_x$ , wherein  $1 < n < 6$  and  $0 < x \leq 13$ , or by a halogen (F, Cl or Br).

20 9. An ionic liquid according to claim 1, wherein at least one pair of  $R^7$  to  $R^{10}$  of the anion is an aromatic ring selected from a phenylene, naphthylene, anthracenylene and phenanthrenylene ring, which is unsubstituted or which is monosubstituted or polysubstituted by  $C_nF_{(2n+1-x)}H_x$ , wherein  $1 < n < 6$  and  $0 < x \leq 13$ , or halogen.

25 10. An ionic liquid according to claim 1, wherein at least one pair of  $R^7$  to  $R^{10}$  of the anion is an aromatic heterocyclic ring selected from a pyridylene, pyrazylene and pyrimidylene ring, which is unsubstituted, or which is monosubstituted or polysubstituted by  $C_nF_{(2n+1-x)}H_x$ , wherein  $1 < n < 6$  and  $0 < x \leq 13$ , or by halogen.

30 11. An electrochemical cell comprising:

35 12. A supercapacitor comprised of at least a pair of electrodes, a separator, and the ionic liquid of claim 1.

13. An electrolyte composition comprising an ionic liquid of claim 1 and an aprotic solvent.

5 14. An electrolyte composition comprising an ionic liquid of claim 1 and a conductive salt.

15. A method for making an ionic liquid according to claim 1, comprising reacting a chloride salt of the formula  $K^+Cl^-$  with a lithium salt of the formula  $Li^+A^-$  within an aprotic solvent.

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